

*Amend* claim 10 to read:

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A2 10. (Amended) A method according to claim [11] 9 in which the cracking catalyst comprises a matrixed faujasite zeolite.

*Amend* claim 11 to read:

11. (Amended) A method according to claim [12] 10 in which the product sulfur reduction catalyst comprises a large pore size or intermediate pore size zeolite as the molecular sieve component, vanadium as the first metal component and cerium as the second metal component.

*Amend* claim 12 to read:

12. (Amended) A method according to claim [13] 9 in which the large pore size zeolite of the product sulfur reduction catalyst comprises zeolite USY.

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#### Remarks

1. This amendment is being submitted as a response to the Official Action of 8 October 1999 in the parent application.

2.1. The Examiner has made a restriction requirement between the following two groups of claims.

Group I: Claims 1-12 drawn to a process.

Group II: Claims 13-25 drawn to a catalyst and method of making the catalyst.

2.2. The Examiner has asserted that the inventions are distinct from each other because they are related as product and process of use. According to the relevant standards for inventive distinctness (MPEP 806.05h) inventions are distinct if the process for using the product as claimed can be practiced with another materially different product or, alternatively, the product as claimed can be used in a materially different process of using that product. In the present case, the Examiner has stated that the catalyst as claimed can be used in a materially different process such as in an

ion sieve process. Assuming, for the moment, that the term “ion sieve process” refers to an ion exchange process, it is submitted that the Examiner has not brought forward any substantial evidence from which this inference may properly be drawn.

2.3. The process of patent examination is to be determined by written evidence of record (35 USC 132) in order to permit adequate review of the record upon any subsequent appeal or further proceedings. See, for example, *Gechter v. Davidson* 43 USPQ 2d 1030, 1033 (Fed. Cir. 1997) The issue is not whether the decision of the Examiner or of the Office is correct merely because factual findings might have been made and considerations disclosed which would justify the decision but rather, there must be a responsible finding of fact *based on the record* indicating the considerations underlying the action under review. See *SEC v. Chenery*, 318 US 80, 89 to 93 (1943). In the present case, it is the presently claimed catalysts and it is the claimed materials which are relevant to this consideration (*cf.* MPEP 806.05h) rather than any general class of materials to which the present products might belong and the Examiner has provided absolutely no factual underpinnings for the unsupported conclusions that the *claimed* catalyst can be used – or might be used or is even capable of being used with any perceptible results - in the specified process. Given therefore that the Examiner’s decision is unsupported by any findings of fact, it is inappropriate and should be withdrawn.

2.4. The Examiner also asserts that the inventions “have acquired a separate status in the art as shown by their different classification” as a basis for the requirement for restriction. This again is a totally unsupported factual finding. If the art in question is the art of catalytic cracking or the manufacture of catalysts for use in catalytic cracking processes, the Patent Office classification has not been shown to be a reflection of any recognized separate status, at least by those who are actively engaged in this art. It may be a reflection of a separate status as recognized by officials of the Patent Office and this may properly reflect a separate status recognized in the art of examining patent applications but it is submitted that this is not the art to which the Examiner has referred nor may it be properly considered as the art upon which a decision of patentable distinction may be made. If this were so, the Patent Office would, by any change in its classification, be able to create supposedly recognized separate classes of status in any given industrial or useful art and then to rely merely upon the classification as the basis

for the purported separate status. Unless supported by evidence of actual recognized separate status in the art, as practiced outside the walls of the Office, such action could only be considered as arbitrary and capricious and an abuse of administrative discretion. In itself, therefore, the statement of the Examiner regarding separate status in the art is wholly lacking in any factually supported justification for the restriction requirement.

2.5. Consistent with the provisional election, applicants elect the invention of Group 1, claims 1-12 drawn to the process and reserved their rights with respect to the claims of Group 2 as well as their right with respect to contest this restriction requirement further. Consistent with this reservation, the nonelective claims are not cancelled at the present time.

3.1 The informality referred to on page 1, line 17 and page 14, line 4, has been attended to by appropriate insertion of the application number which was not available at the time of filing this application.

3.2. The informalities in claims 10-12 have been dealt with by appropriate amendment.

3.3. Further informalities, which arose as a result of an error in the original specification have been corrected in claim 2, and on page 12, line 11 of the specification as well as the abstract. These portions of the application referred to metals of Groups 5, 8, 9 and 12 of Period 3 of the Periodic Table and implied that the metals vanadium, zinc, iron, cobalt and gallium were in this class. However, there are no Groups 5, 8, 9 or 12 in Period 3 of the IUPAC Periodic Table as shown by the attached copy of the Periodic Table of the Elements taken from the CRC Handbook of Chemistry and Physics, 67<sup>th</sup> Edition, 1986 CRC Press. Note that in Period 4, the metals of Groups 5, 8, 9 and 12 are, respectively, vanadium, iron, cobalt and zinc as stated to be preferred.

4.1. The Examiner has rejected claims 1-3, 5, 6 and 8 under 35 USC 102(b) as anticipated by Beck U.S. 4,588,702.

4.2. Beck discloses a catalytic cracking process for hydrocarbon feeds which may contain polar compounds such as sulfur substituted hydrocarbons (column 14, lines 13-

14. The Examiner's reference to column 9, lines 29-31 providing a factual underpinning for the conclusion that sulfur compounds may be present in the feed does not appear to be correct but in view of the presence of this common contaminant in many of the feeds subjected to catalytic cracking this point will not be contested further now, especially in view of the disclosure in column 33, line 8, indicating the presence of sulfur in a typical feed. According to the Beck patent, the catalyst which is to be used for the production of gasoline by the catalytic cracking process may include a number of difference components including a wide-type zeolite, a clay, an acidic silica-alumina co-gel matrix, alumina and, as metal components, from 0.1 to 3 wt% (claim 1, column 35, lines 10-12), generally 0.5 to 2.0 wt% (column 18, line 50-51). It is stated that the rare earths are partially exchanged onto the zeolite from solution, with the zeolite being contained in the acidic matrix (silica-alumina co-gel) with a portion of the rare earth precipitated into the matrix (column 35, lines 15-19). From this, the Examiner concludes that Beck discloses a cracking process with steps and catalyst components corresponding to those claimed by applicants. See office action, page 5. The Examiner concedes that the reference does not refer to a reduction in the sulfur concentration of the feed (correctly stated, this would be a reduction in the total sulfur concentration of the liquid products since the sulfur content of the feed remains what it is) but the Examiner considers the sulfur reduction to be an inherent feature of the process for the reasons specified on page 5 of the office action.

4.3. Applicants do not concede that the Beck patent anticipates the claims in question because there is nothing in Beck which indicates that the lanthanum component (assuming that the Examiner is referring to the lanthanum as the counterpart of the "first metal component" of the present catalyst) is present in the interior pore structure of the molecular sieve in an oxidation state greater than zero. Concededly, when the lanthanum is exchanged onto the zeolite, it will necessarily be present in the form of cations exchangeable with the hydrogen cations on the acid formed zeolite and when this is done, the rare earth cations will obviously be in an oxidation state greater than zero. However, this does not necessarily imply that the metals will be in an oxidation state greater than zero when used in the process. During part of the entire catalytic cracking cycle, the catalyst is exposed to reducing conditions (in the riser) a matter on which Beck is silent. It is therefore submitted that Beck, in the absence of any further

actual considerations which might be advanced, does not, as asserted by the Examiner, disclose the same process steps and catalyst claimed by the applicants.

4.4. In any event, it is submitted that Beck does not disclose the subject matter of original claim 2, which referred to the use of specific metals as the first metal component, used in addition to the cerium component. There is nothing in Beck which teaches use of the metals vanadium, iron, cobalt or zinc within the interior pore structure of the molecular sieve component of the Beck catalyst, which these metals being in an oxidation state greater than zero. The Examiner has not even sought to contend that this is so, referring only to the use of lanthanum and cerium in the Beck catalyst. It is therefore submitted that the rejection under 35 USC 102(a) based on the Beck patent is wholly inapplicable to claim 2 and furthermore, is not warranted by any substantial evidence of record. It is noted that the Examiner did not apply the rejection to claims 4 and 7, which refer to zinc or vanadium as the first metal components, indicating that the use of these metals in the catalyst is free of any anticipation by the Beck reference. The same considerations hold true with respect to claim 2 and for this reason the rejection with respect to claim 2 at least should be withdrawn.

5.1. Claim 4 has been rejected under 35 USC 103(a) as unpatentable over Beck in view of Kugler, U.S. 4,944,864. Here, the Examiner concedes that a difference is noted between the Beck reference and applicant's claimed invention in that Beck does not disclose the use of a vanadium containing catalyst. The Examiner refers, however, to Kugler to show that it is "known in the art that vanadium contaminants in a hydrocarbon feed which remain on the catalyst during regeneration are oxidized and that the oxidized vanadium compounds become mobile and react with the zeolite components of the catalyst" From this the conclusion is that the regenerated catalyst contains vanadium (office action, page 6). The Examiner then infers that it would have been obvious to one of ordinary skill in the art to utilize a vanadium containing catalyst because the reference of Kugler teaches that it is known in the art that regenerated catalyst recycled for further cracking would contain vanadium components. This remarkable assertion is inconsistent with the state of knowledge in the art and with any reasonable interpretation of the Kugler reference which might be drawn by a person of skill in the art of catalytic cracking.

5.2. First, it is pointed out that the legal standard under 35 USC 103 is that in assessing the obviousness of any claimed combination, it is always necessary to determine whether the prior art establishes the desirability rather than the mere possibility of making the adduced combination since obviousness is measured by a prior art showing of desirability rather than mere possibility. *In re Gordon* 221 USPQ 1125, 1127 (Fed. Cir. 1984). *In re Deminski* 230 USPQ 313, 315 (Fed. Cir. 1986). *In re Laskowski* 10 USPQ 2d 1397, 1398 (Fed. Cir. 1989). *In re Geiger* 2 USPQ 2d 1276, 1278 (Fed. Cir. 1987). This point is clearly emphasized by the court in *Laskowski*:

"[t]he mere fact that the prior art could be so modified would not have made the modification obvious unless the prior art suggested the desirability of the modification" [Citations to *Gordon*, *Interconnect*, *In re Grabiak*, *In re Sernaker*]. 10 USPQ 2d 1398.

The prior art must, if it is to be effective against the claims in question, contain some incentive to make the adduced combination of claimed features. *In re Fritsch* 972 F.2d 1260, 1266 (Fed. Cir. 1992). The court stated:

"When the references used in an obviousness rejection fail to provide any incentive to combine prior art teachings, the mere fact that they can be combined does not support the rejection; rather, it demonstrates an impressionable hindsight reconstruction, using the claimed invention as an instruction manual to piece together those teachings".

5.3. Here, there is no showing on the record – nor, it is submitted, is any likely to be possible - that there would be any incentive to include vanadium in the zeolite component of a catalytic cracking catalyst. For this reason, no person of true skill would regard the addition of vanadium to the catalyst as in any way desirable.

5.4. The Beck reference is itself instructive in this respect. Beck notes that "a second reason for the high pore volume is due to the high metals e.g. nickel, vanadium and iron, contained in the feeds utilized with the present invention which can gradually build up on the outer surface of the catalyst, decreasing pore volume and blocking off the acidic matrix from contact with fresh feed materials". (Beck, column 19, lines 25-30). Thus, Beck recognizes that vanadium has an undesirable effect on the catalyst as a whole and this view is extended by Kugler in relation to the zeolite component of the catalyst.



5.5. Kugler is concerned with a fluid catalytic cracking process and especially with a method of using the catalyst on hydrocarbons, which contain one or more soluble metal poisons including vanadium, nickel or iron (column 1, lines 13-15). The Kugler catalyst contains one or more water-insoluble strontium compounds in addition to the zeolite and the catalyst matrix which are intended to react with and trap the metal poison so as to preserve the structure of the zeolite and, in addition, lower the coke and hydrogen production during the process (column 1, lines 19-22). The following portion from Kugler is of particular note and requires to be quoted in full:

“[T]he heavier crudes contain substantially more organic metal compounds, such as vanadium and nickel porphyrins. These metals cause many undesirable reactions in heavy oil cracking catalysts in that the metals, specifically nickel and vanadium, are quite harmful to the fluidized cracking catalysts used. These metals, present in the high-boiling fractions, deposit on cracking catalyst and accumulate with time. They act as poisons and have the resulting effect of increasing undesirable hydrogen and coke yields and as well as decreasing the selectivity of the catalyst in making liquid products. Recently, vanadium has been found not only to increase hydrogen and coke yields but also to attack the zeolite itself, the high activity component of a catalytic cracking catalyst. See, Ritter et al, “A Look at New FCC Catalysts for Resid”, Oil and Gas J., July 6, 1981, pg. 103. The mode of vanadium attack is not understood; however, available data indicate that vanadium can migrate through the catalyst particle and accumulate in areas of high zeolite concentration”.

From this passage it is clear that the presence of vanadium in the feeds which are processed in the FCCU is considered highly undesirable: the vanadium acts as a poison which degrades the structure of the zeolite and diminishes the high activity of the zeolite component of the catalyst. Note that Kugler refers to the migration of the vanadium through the catalyst particle to areas of high zeolite concentration (column 1, lines 54-58) where, the zeolite being susceptible to vanadium attack (column 1, lines 59-60) is directly attacked (column 1, line 51). Kugler notes that the past practice has been either to avoid charging high boiling point feedstocks (since the vanadium containing porphyrins are concentrated in the high boiling fractions) or limiting total metal concentrations to a low level (column 1, lines 63-66). The use of various passivation procedures has been also proposed but what is clear overall, is vanadium is considered a highly undesirable factor in the fluid catalytic cracking process. This is

supported by the Wormsbecher article referred to on page 12 of the specification, of record.

5.6. Given, therefore, the strong antipathy to the presence of vanadium in the FCC process, it stretches the imagination why a person of ordinary or, indeed, any degree of skill in the art would have considered it rationally desirable and therefore obvious, to incorporate vanadium deliberately into a catalyst to be used in the process. The logic of the thing is that a person skilled in the fluid catalytic cracking art would have considered it very *undesirable* to have vanadium present at all in the catalyst, and with greater reason, on the zeolite component of the catalyst. To put vanadium directly on or even in the zeolite component where it would have been expected to have a poisonous, destructive effect on the zeolite structure and on catalytic activity, flies in the face of reason. Certainly, there is no reason apparent on the face of the art of record why any incentive to add vanadium to a catalytic cracking catalyst might exist.

5.7. Since obviousness is, as noted above, to be properly measured by desirability not mere possibility, it is submitted that the Examiner's inference is incorrect: it would not have been obvious to one of ordinary skill in the art to utilize a vanadium-containing catalyst even in view of the fact that catalysts recycled for further cracking may contain vanadium components picked up from the cracking feed. In fact, the presence of the vanadium was *undesirable* and a person skilled in the art would not have sought to incorporate vanadium directly into the catalyst at all, far less into the "interior pore structure of the molecular sieve" (*cf.* Claims 1 and 9) as this component was thought to be directly subject to attack by the vanadium which a consequent diminution of catalytic structure and activity. The discovery that vanadium could be usefully incorporated into the present catalyst with a desirable catalytic effect (sulfur reduction) without significant deterioration of catalytic activity was totally unexpected. Clearly, the manner of incorporation of the vanadium into the catalyst is a significant feature of the present invention and this is neither disclosed nor made obvious by the disclosure in Kugler or any other reference of record. Reconsideration of this rejection is therefore in order.

6.1. Claim 7 has been rejected under 35 USC 103(a) as unpatentable over Beck in view of Tan-no, U.S. 5,646,082 and Kugler. The Examiner has noted that several



differences are noted between the reference of Beck and the claimed invention, including the specific UCS, the silica:alumina ratio of the USY composition and the use of the vanadium component (office action, page 7).

6.2. The Tan-no reference has been cited to show that it is conventional in the FCC art to crack a feed in the presence of a USY containing catalyst, with a rare earth component and a UCS in the range of 24.45 to 24.55Å (2.445-2.455 nm) and a silica:alumina ratio of 5-11. While the factual teachings of Tan-no as set out in U.S. 5,646,082 are conceded, with the notation that Tan-no refers to the zeolite not as a USY zeolite, as suggested by the Examiner (office action, page 7) but rather, as a stabilized zeolite Y of improved stability obtained by hydrothermal treatment and optional treatment with mineral acid and other materials (column 3, lines 46-54) and a specific heat shock treatment (column 4, lines 28-58). More importantly than this, however, the combination of references cited against claim 7 does not indicate the obviousness of using a vanadium component in the catalyst. As pointed out in Section 5 above, it would not have been obvious to one of ordinary skill in the art to use vanadium in an FCC catalyst at all because of its undesirable effects both upon the catalyst as a whole (see Beck) and specifically, the zeolite component of the catalyst (see Kugler). Applicant therefore rejects the suggestion that it would have been obvious to utilize a vanadium containing catalyst because of Kugler's teaching regarding the presence of vanadium components in the FCC process. Reconsideration and withdrawal of the rejection of claim 7 is therefore required.

7.1. Claims 9-12 have been rejected under 35 USC 103(a) as unpatentable over Beck in view of Occelli, U.S. 4,615,996. The Occelli reference is relied on to support the proposition that is conventional in the art to use FCC catalysts with particle sizes less than 75 microns. This much may be conceded although it is pointed out that the passages cited by the Examiner do not appear to support the proposition. A more relevant portion of the Occelli reference would be the passage at column 7, lines 59-67.

7.2. With respect to the substantive merits of this rejection, the comments set out above with respect to the Beck reference are reiterated. There is nothing in Beck which indicates the desirability and therefore the obviousness of using a catalyst which contains a first metal component within the interior pore structure of the molecular sieve

in an oxidation state greater than zero in combination with cerium within the interior pore structure of the sieve. More specifically, there is nothing in Beck which indicates the obviousness of using vanadium or zinc as the first metal component and cerium as the second metal component and as noted above, the use of vanadium would have been considered highly undesirable in the art, especially when specifically combined with the zeolite component of the catalyst. This rejection should therefore be withdrawn, especially with regard to claim 11.

8.1. The final rejection made by the Examiner is a double-patenting rejection based on co-pending application Serial No. 09/221,540 (Mobil Case 10102-1) making this rejection provisional in character. Applicant does not concede the correctness of this rejection.

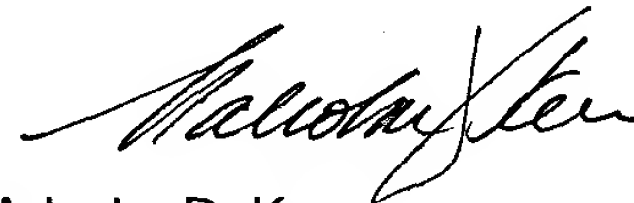
8.2. The present application refers to the fact that there is a difference in catalytic activity between the catalyst which contains cerium as the rare earth component on the one hand, and catalysts which contain rare earth mixtures, on the other (page 23, lines 16-24). It is noted there that among the rare earth ions, cerium exhibits a unique property in that the cerium/vanadium/USY catalyst not only exhibit higher cracking activity but also exhibit increased gasoline sulfur reduction activity in the FCC process. This difference in catalytic activity is unexpected (at least, as far as indicated by any reference of record) and because of this, the cerium containing catalysts of the cited application are considered to be patently distinct from those of the present application. The Examiner appears to have overlooked this fact since it is not referred to in the office action.

8.3 The determining factor in deciding whether or not there is double patenting is the existence or absence of a patentable distinction between two sets of claims: if there is a "patentable distinction" or the claims are "patently distinguishable" there is no double patenting. *General Foods Corp. v. Studiengesellschaft Kohle mbH*, 23 USPQ 2d 1839, 1844 (Fed.Cir. 1992) citing *In re Borah*, 148 USPQ 213 (CCPA 1966) and *In re Stanley*, 102 USPQ 234 (CCPA 1954) and *In re Calvert*, 38 USPQ 184 (CCPA 1938). In the *Stanley* decision, the court approved the issuance of a dominating patent to the owner of an improvement patent on the basis that a patentable distinction existed between the claimed inventions. Similarly, in *General Foods*, the facts indicated that a patentable

distinction existed between the claimed inventions. The existence of an unexpected improvement over what is notionally a basic invention is sufficient to negate a case of double patenting. *In re Braat*, 109 USPQ 2d 1289 (Fed.Cir. 1991). In the present case, it may be conceded that domination of the "cerium invention" may occur by the claims directed to the "rare earth invention" but domination is not the test of double patenting. *In re Kaplan*, 229 USPQ, 678, 681 (Fed.Cir 1986). It is submitted that the difference in catalytic activity between the cerium and the other rare earths is unexpected and could not have been predicted by a person of skill in this art. On this basis, it is submitted that there is no double patenting between the present application and the cited application and for this reason the double-patenting rejection should be withdrawn.

9. In view of the amendments and remarks set out above, allowance of the application is requested.

Respectfully submitted,



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Date: 1 June 2000

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Numbers in parentheses are mass numbers of most stable isotope of that element

From *Chemical and Engineering News*, 63(5), 27, 1985. This format numbers the groups 1 to 18.

From *CRC Handbook of Chemistry and Physics*.  
67th Edition, 1986 CRC Press.